

Insular odonates in Melanesia: a new species of damselfly from Manus Island, Papua New Guinea (Zygoptera: Platystictidae) and comments on *Nososticta manuscola* Theischinger et Richards

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Abstract: A new species of damselfly, *Drepanosticta gazelle* sp. nov., is described from Manus Island, Papua New Guinea. The new species is most similar to *D. antilope* Theischinger et Richards, 2005, another insular species known only from New Britain Island to the south-east of Manus. The female of *Nososticta manuscola* Theischinger et Richards, 2015, a species previously known from a single male, is described for the first time and data on variation in male morphology are provided.

Key words: Damselfly, Zygoptera, Admiralty Archipelago, *Drepanosticta*, *Nososticta*, variation, new species.

Introduction

The odonate fauna of Manus Island in Papua New Guinea's remote Admiralty Archipelago remains poorly known. Richards et al. (2015) reported 20 species from Manus, most of which also occur on mainland New Guinea or on other Pacific islands (Michalski 2012; Kalkman & Orr 2013; Orr & Kalkman 2015). Exceptions are an endemic damselfly, *Nososticta manuscola* Theischinger et Richards, 2015 described from Manus Island on the basis of a single male specimen and a photograph of a female, and an undescribed platystictid damselfly of the genus *Drepanosticta* Laidlaw, 1917 that is currently known only from the vicinity of Mt Sabomu on Manus Island's south coast (Richards et al. 2015).

Here we provide additional data on the poorly-known endemic damselfly *N. manuscola*, including the first comprehensive description of the female and information on morphological variation in males. We also formally describe the previously unnamed *Drepanosticta* species. It is likely that additional field work in this remote island archipelago will reveal more odonate novelties.

Materials and methods

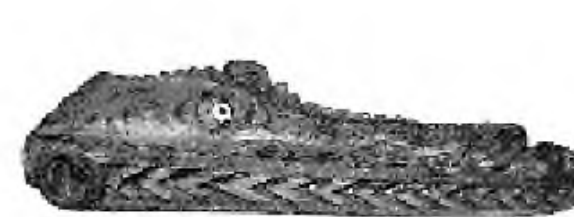
Descriptive terminology largely follows Watson & O'Farrell (1991). Colouration is given as detectable from the preserved material, supplemented with photographs of specimens taken in life. Measurements are given in millimeters (mm). All illustrations were done with the aid of a camera lucida and are not to scale. Coordinates are presented using the GPS datum WGS 84. Material is lodged in the collection of the South Australian Museum in Adelaide, Australia (SAMA).

Taxonomic part

***Drepanosticta gazelle* sp. nov.** (Figs 1-6, plates 101 fig. 1, 102 fig. 1)

Holotype ♂ SAMA 07-001460: Papua New Guinea, Manus Island, Mt Sabomu, within 250 m of: 2.193°S, 146.967°E; 456 m a.s.l., 04 October 2014, S.J. Richards.

Paratypes 4 specimens (all from Papua New Guinea, Manus Island): 1♂ & 1♀ SAMA 07-001461-62: same data as holotype; 1♂ SAMA 07-001463: Piri Village,



2.211°S, 146.965°E; 40 m a.s.l., 03 October 2014; 1♂
SAMA 07-001463: same locality but 06 October 2014;
all leg. S.J. Richards.

Derivatio nominis: The specific name 'gazelle' refers to the antler-shaped processes on the posterior lobe of the male and female pronotum; it is used as a noun in apposition to the generic name and also alludes to the probable close relationship of the new species to *Drepanosticta antilope* Theischinger et Richards, 2005.

Diagnosis: A small slender species, distinguished from all congeners by a combination of the following characters: largely black with limited pale greyish yellow markings (Plate 101 fig 1, plate 102 fig. 1); poststernum very pale, the posterior lobe of pronotum in both sexes elaborate; transverse occipital carina developed into a point on each side; male superior anal appendages shorter than inferiors and having both a dorsal and an inner medial tooth. **Description of holotype (male):** Head – Largely blackish brown to black with most of labrum, all of mandible base and adjacent portion of genae and anteclypeus, more than anterior half of postclypeus, part of antennal scape and all of pedicel whitish yellow; labium pale brown and approximately anterior third of labrum dark brown. Prothorax (Figs 1-2) – Notum largely yellowish to brownish grey, narrowly black along the black pleura; posterior lobe markedly raised posteriorly, with pair of plump antler-like processes. Legs pale greyish to brownish yellow with knees, apex of tibiae and terminal tarsal segments slightly darkened. Synthorax – Mesopleura largely bronze-black without distinct antehumeral markings; metapleura greyish to brownish yellow merging into broad greyish brown patch along both sides of metapleural suture; metapostepimeron pale greyish yellow with dorsal edge black. Postcoxae and poststernum very pale greyish yellow. Legs much as in prothorax. Wings – Membrane hyaline, very slightly suffused with pale yellowish to greyish brown. Venation blackish brown to black. Pterostigma brownish grey, almost twice as long as wide, generally overlying slightly more than one cell, proximally very slightly convex, distally rather strongly so; postnodals 18/18. Abdomen – Largely bronze-brown to bronze-black; only posterior dorsal edge of S1, posterior portion of S7, bases of S3-8 and ventral edges of S8 and S9 greyish yellow to brownish grey but the dark and pale areas merging into each other and thus not well defined. S10 and long narrow hooked inferior anal appendages greyish yellow to brownish grey, superior anal appendages slim, pale greyish yellow,

undulate in lateral view, with well-defined medial tooth close before mid-length and dorsal tooth not much beyond (Figs 3-4). Measurements (mm) – Hw 21.0, abdomen (including anal appendages) 33.2. **Description of female:** Head much as in male. Prothorax coloured much as in male; processes of posterior lobe with stem markedly more slender, but apex almost as large as in male (Figs 5-6). Synthorax much as in male. Legs similar to male but femora slightly darker and tibiae and tarsi more uniformly greyish brown. Wings similar to male; postnodals 16-17/17. Abdomen much as in male but pale and dark areas even less distinct and less strongly defined. Ovipositor black and brownish yellow; anal appendages pale brownish yellow. Measurements – Hw 19.5, abdomen 26.5.

Variability: The male paratypes agree well with the holotype in structure and coloration but are somewhat smaller. Their postnodals numbers are 16-20/15-17, their measurements 18.3-19.1 mm (Hw) and 27.8-29.5 mm (abdomen plus anal appendages). Both males from Piri Village are smaller than the three males from the type locality, and they have fewer postnodals.

Differential diagnosis: The description of *Drepanosticta gazelle* sp. nov. brings to three the number of Papuan species of *Drepanosticta* Laidlaw that share a transverse occipital carina developed into a point on each side, lack of pale antehumeral markings and male superior anal appendages that are shorter than the slender hooked inferiors and have both a dorsal and a medial tooth. The others are *D. antilope* Theischinger et Richards, 2005 from New Britain and *D. exoleta* Lieftinck, 1932 from northern Papua New Guinea (Michalski 2012; Kalkman & Orr 2013), and these three species are presumably closely related. The male of *Drepanosticta gazelle* can be distinguished from *D. exoleta* by having the two teeth on the male superior anal appendages close together (vs widely separated in *D. exoleta*; Fig. 7). The pronotal processes of male *D. gazelle* (Figs 1-2) are apically more strongly developed than in *D. antilope* (Figs 8-9), and the anal appendages (Figs 5, 6) are more slender. The female of *D. gazelle* has the pronotal processes (Figs 5-6) similarly elaborate as the male, whereas they are simple elongate lobes in *D. antilope* (Figs 10-11). Both sexes of *D. gazelle* differ from *D. antilope* by the very pale vs very dark poststernum.

Habitat: *Drepanosticta gazelle* sp. nov. was found along several streams draining Mt Sabomu on the south coast of Manus Island, between about 40 m a.s.l. near the coast at Piri Village and 456 m a.s.l. just below the mountain's summit (Plate 103 fig.

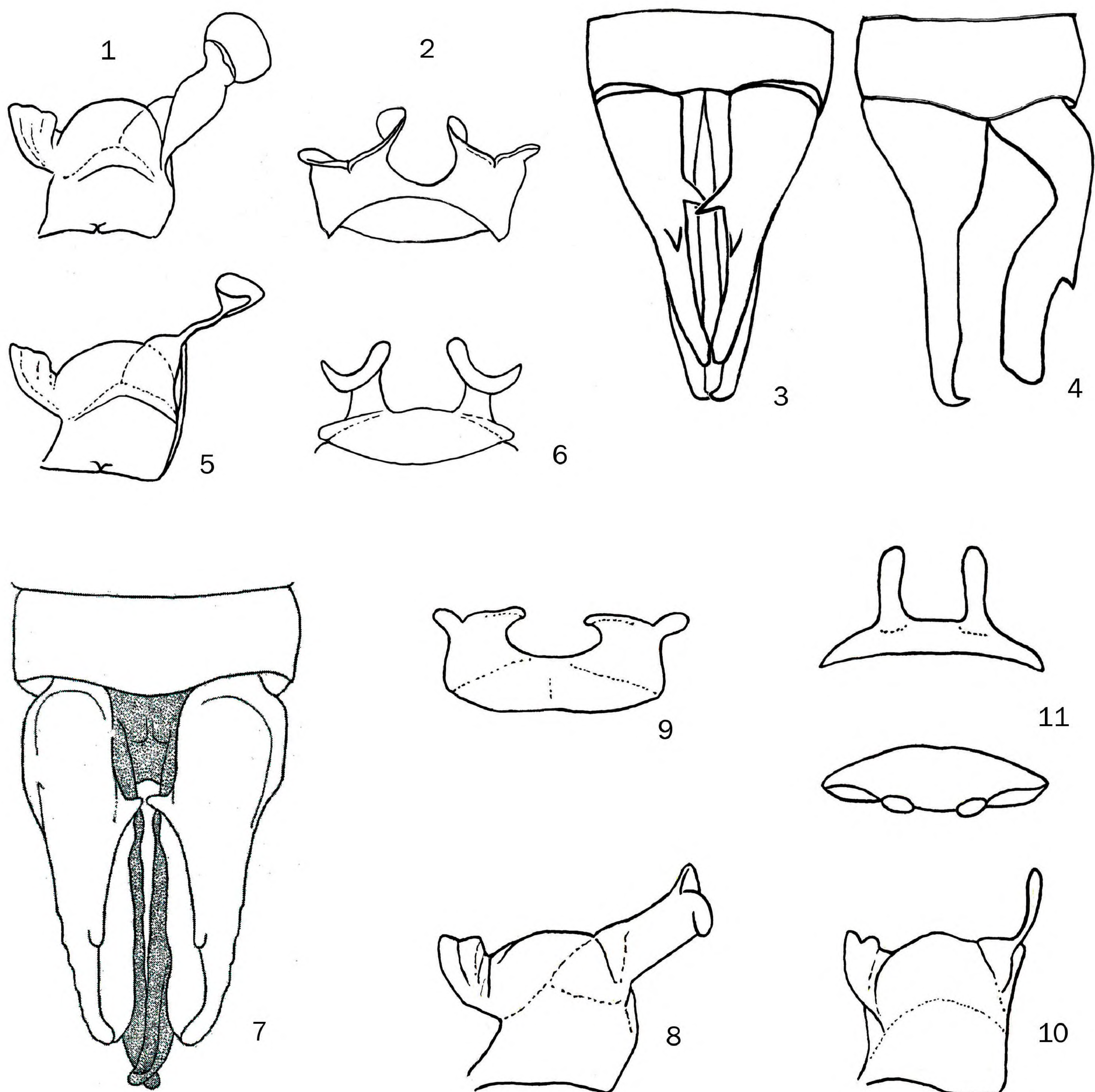


1). Despite intensive searches, it was not found at any lowland sites with lower-gradient streams (Richards et al. 2015) and this species may be restricted to high-gradient forest streams on Manus Island. Like other members of the genus on mainland New Guinea it is a secretive species, perching motionless for long periods in densely vegetated shady areas adjacent to clear forest streams. It was also found at low densities in shady areas

along streams traversing the disturbed forest and gardens around Piri Village.

Variation in *Nososticta manuscola* Theischinger et Richards, 2015 (Figs 12-15)

Material studied: Papua New Guinea, Manus Island: 1♂ SAMA 07-001465: Mt Sabomu, 2.193°S, 146.967°E; 456 m a.s.l.; 03 October 2014; 6♂ & 1♀ SAMA 07-001466-70, 07-001486-87: same locality but 04 October 2014; 1♂ SAMA 07-001488: Piri Village,



Figures 1-11. Damselflies of Manus Island. 1-4: *Drepanosticta gazelle* sp. nov., ♂: 1 - Prothorax, lateral view; 2 - Posterior lobe of pronotum, dorsal view; 3-4: Anal appendages: 3 - dorsal view; 4 - lateral view; 5-6: ♀: 5 - Prothorax, lateral view; 6 - Posterior lobe of pronotum, dorsal view; 7 - *Drepanosticta exoleta* Lieftinck, 1932, ♂ anal appendages, dorsal view (modified from Lieftinck (1932)); 8-11: *Drepanosticta antilope* Theischinger et Richards, 2005 (modified from Theischinger & Richards (2005)): 8-9 - ♂: 8 - Prothorax, lateral view; 9 - Posterior lobe of pronotum, dorsal view; 10-11 - ♀: 10 - Prothorax, lateral view; 11 - Posterior lobe of pronotum, frontal and dorsal view.



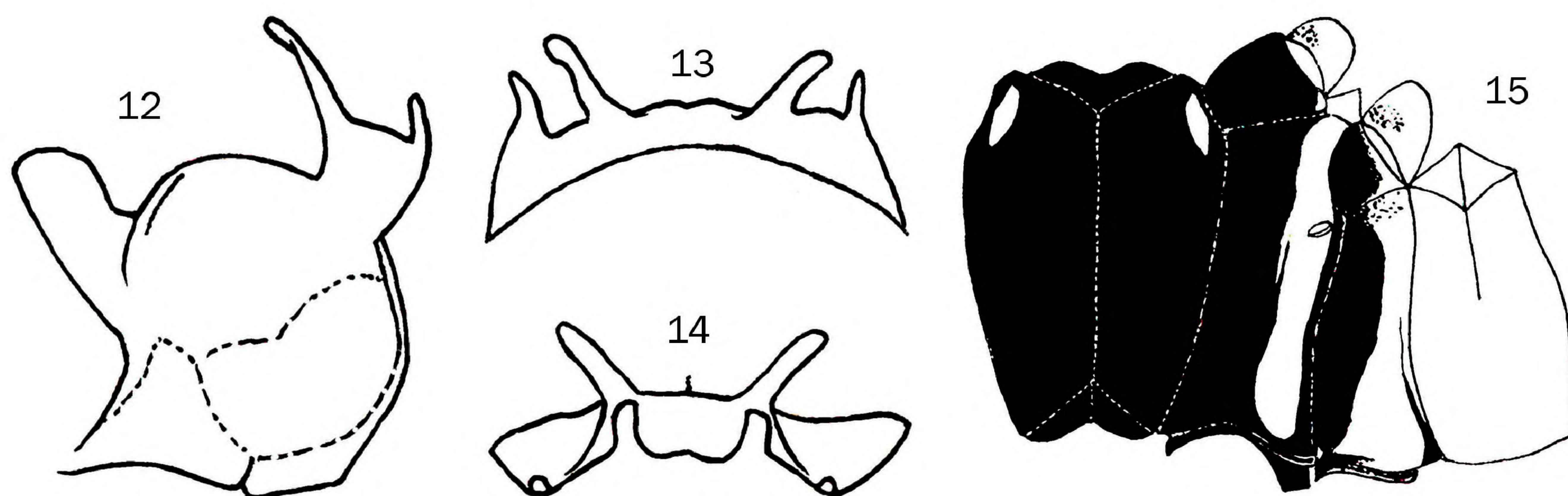
2.211°S, 146.965°E; 40 m a.s.l.; 03 October 2014; 1♂ SAMA 07-001489: same locality but 06 October 2014; all leg. S.J. Richards.

This new material allows us to complement the description provided by Theischinger & Richards (2015) of the male based only on the holotype (and then only known) specimen and to present the first detailed description of the female.

Male variation: The original description of male colouration in life was based on a photograph of a rather young individual (photo 10 in Theischinger & Richards (2015)). Collection of additional, mature male specimens has revealed some differences in colouration (Plate 102 fig. 2) and these are described here along with variation in wing venation and body measurements. In more mature males the pale markings on head, thorax and abdomen including the anal appendages do not appear bluish, as originally described, but rather uniformly whitish to very pale greenish or brownish yellow. The lateral spot on tergum 1 is hardly noticeable, and only the extreme edge of tergum 9 shows some pale colour. The wing membrane of most specimens is slightly suffused with pale greenish brown, and there are 15-16/11-15 postnodals. The transverse crossvein descending from the distal margin of the discoidal cell is missing in only one of 36 wings; CuP reaches wing margin between 1/3 and 4/5 length of first cell following discoidal cell. The hindwing length ranges from 17.6-19.6 mm, the abdomen (+ anal appendages) length from 29.4-34 mm.

Description of the female: (Figs 12-15, plate 102 fig. 3) **Head** – Largely black; only approximately basal half of labium whitish grey, and a rather wide bar from eye to eye across anterior frons and genae adjacent to postclypeus pale brownish yellow. **Thorax** – Pronotum (Fig. 12) black, median lobe slightly raised into a well-rounded bump each

side, posterior lobe (Figs 13-14) with two sets of slender lateral lobes, the inner longer than the outer, and with slightly bilobed median plate; propleura largely pale brownish yellow. **Synthoracic pleura** largely black with the following areas pale brownish yellow (Fig. 15): tiny, suboval mesepisternal patch, hardly longer than 1/6 of anepisternum; mesepimeral/metepisternal patch, roughly parallel sided, covering only tiny parts of posterior edge of mesepimeron but full length and width of metepisternum; metepimeral patch as long as metepimeron; posteroventral corner of katepisterna, more extensive in metakatepisternum; narrow ventral section of metapostepimeron. **Postcoxae** dull greyish yellow, **poststernum** very pale yellow. **Coxae** and **trochanters** pale brownish yellow, **meso-** and **metacoxa** anteriorly with small dark basal patch; **femora** with upper face and apical section black, otherwise brownish to greyish yellow; **tibiae** with inner face and apically black, otherwise largely pale brownish yellow; **tarsi** black; **claws** brown; overall the forelegs are darkest, the hindlegs palest. **Wings** – Venation black; membrane hyaline; pterostigma brownish- to blackish grey, slightly widening distally, approximately twice as long as wide and overlying 1 cell; 14/12 postnodals; a transverse crossvein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin approximately 1/2 length of first cell following discoidal cell. **Abdomen** – Terga 1 and 2 dorsally black, laterally pale to somewhat darker brownish yellow; terga 3-9 dorsally broadly black, latero-ventrally pale brownish yellow, only tergum 3 with indication of small pale basal spot each side; segment 10 largely black, merging into yellowish brown only ventrally. **Sterna** largely blackish brown, merging into brownish yellow apically. **Ovipositor** reaching slightly more than length of S10 beyond S10; **terebra** brown; **valves** pale brownish yellow. **Anal ap-**



Figures 12-15. *Nososticta manuscola* Theischinger, Richards, 2015 ♀: 12 – Prothorax, lateral view; 13-14: Posterior lobe of pronotum: 13 – frontal view; 14 – dorsal view; 15 – Synthorax, frontal, lateral, ventral view.



pendages black. Measurements [mm] – Hindwing 19.3-19.5; abdomen 30.5-30.9.

Habitat: On Manus Island *N. manuscola* reaches high densities along clear streams in forest, and on Mt Sabomu it occurred in sympatry with *Drepanosticta gazelle* sp. nov., described above. It also persists in disturbed habitats, including forest and garden regrowth in the vicinity of streams. The species appears to be endemic to Manus Island, although its occurrence on other islands in the archipelago cannot be discounted. It was not encountered on Mussau Island to the north-east of Manus during a survey there in 2014 (Richards et al. 2015) and it has not been reported from northern mainland New Guinea or the Bismarck Archipelago (e.g. Gassmann 2015). Despite its limited known distribution, the ability of *N. manuscola* to persist in degraded habitats suggests that the future of this endemic species is probably secure.

Discussion: *Nososticta manuscola* is the only member of this speciose and widespread Australopapuan genus known from the Admiralty Archipelago. In the original description (Theischinger & Richards 2015), *N. manuscola* was considered to be most similar to *N. marina* (Ris, 1913), a species from southern mainland and insular New Guinea. Examination of the additional material reported here confirms the distinctiveness of these two species. In particular the presence of a transverse crossvein descending from the distal margin of the discoidal cell in the wings of *N. manuscola* clearly distinguishes this species from *N. marina* (which lacks this crossvein). There also appear to be consistent differences in size and shape of the antehumeral patch. In male *N. manuscola* it is shaped like a ‘tear-drop’ (Plate 102 fig. 2) and extends just 1/3 of the length of the mesanepisternum, which is markedly shorter than in *N. marina* where the narrowly oval-shaped patch extends from slightly less than, to slightly more than, 1/2 the length of the mesanepisternum (e.g. photo 8 in Theischinger & Richards 2016).

Acknowledgements

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Manus Island. Barnabas Wilmott (DEC) issued the export permit for odonate specimens, Peter Hudson (South Australian Museum, Adelaide) provided registration numbers for type material, and Nathan Whitmore not only organised an excellent field survey but also magically produced freshly baked bread under a tarpaulin on the summit of Mt Sabomu.

We thank Dirk Gassman (Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany) for reading the manuscript and providing helpful comments.

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Plate 101

THEISCHINGER, G. & RICHARDS, S.J.: Insular odonates in Melanesia: a new species of damselfly from Manus Island ...



Figure 1. *Drepanosticta gazelle* sp. nov. ♂, lateral view (photo: S.J. Richards).

Plate 102

THEISCHINGER, G. & RICHARDS, S.J.: Insular odonates in Melanesia: a new species of damselfly from Manus Island ...



1



2



3

Figures 1-3. Manus Island damselflies. 1 – *Drepanosticta gazelle* sp. nov. ♀, lateral view; 2-3: *Nososticta manuscola* Theischinger et Richards, 2015: 2 – ♂, lateral view; 3 – ♀, lateral view (photos: S.J. Richards).

Plate 103

THEISCHINGER, G. & RICHARDS, S.J.: Insular odonates in Melanesia: a new species of damselfly from Manus Island ...



Figure 1. Forest stream on the upper slopes of Mt Sabomu, Manus Island, habitat of both *Drepanosticta gazelle* sp. nov. and *Nososticta manuscola* Theischinger et Richards, 2015 (photo: S.J. Richards).